



ACEEE WATER AND WASTEWATER ENERGY ROADMAP  
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Stakeholder Survey Results  
*One in a Series of ACEEE White Papers*

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Water and wastewater utilities are under increasing pressure to provide safe, reliable services at level or decreasing costs. Concurrently, energy efficiency policymakers, researchers, program implementers and other expert stakeholders have identified this sector as having a high potential for energy and subsequently cost savings. This synergy spurred the creation of a small network of forward-thinking water and wastewater utilities and energy efficiency stakeholders. In the past few years, they have worked to identify cost effective energy efficiency opportunities in the sector, most recently at the 2003 American Water Works Association Research Foundation (AwwaRF) and the California Energy Commission (CEC) research roadmap meeting. This effort identified an array of research opportunities for energy efficiency improvements in the water and wastewater sectors. Late in 2003, the American Council for an Energy-Efficient Economy (ACEEE) began organizing a roadmap workshop to build on that work and incorporate operational and program activities. In preparation for the meeting, ACEEE carried out a limited survey of stakeholders to identify the issues that would be valuable to discuss at a national venue.

This white paper presents the results of that survey and proposes discussion topics for the ACEEE National Water and Wastewater Energy Roadmap meeting in Washington, D.C., in July 2004. The survey questions were designed to be thought-provoking for stakeholders and spur creative thinking regarding major opportunities and challenges for energy efficiency in the water and wastewater sectors. The results provide direction to the roadmap creation process, and identify commonalities and gaps in understanding within the water and wastewater communities regarding the benefits and costs of energy efficiency. The survey and this report do not definitively state all the opportunities and barriers to promoting energy efficiency in the water and wastewater sectors, but provide a selection of ideas and opinions from a broad cross-section of interested stakeholders. This paper provides details of the survey process, results, discussion of the results and suggestions as to how these results may direct discussion at the roadmap meeting.

**Methodology.** In the fall of 2003, ACEEE assembled a small group of water, wastewater, and energy efficiency experts to serve as a steering committee for an ACEEE project on energy efficiency in the water and wastewater sectors.<sup>1</sup> This steering committee assisted in the identification of a wider group of stakeholders and the design of the survey instrument. The final instrument was a series of close- and open- ended questions identifying what the respondent believes to be the biggest opportunities for energy efficiency in the water and wastewater sectors, as well as the largest barriers to those opportunities. Respondents were asked to identify specific research, market, technical and government policy areas that would facilitate lowering these

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<sup>1</sup> The ACEEE Water and Wastewater Energy Roadmap Project is funded by NYSERDA, the Iowa Energy Commission, the California Energy Commission, and WERF.

barriers. Each identified stakeholder (see next paragraph) received a comprehensive survey package including the survey instrument, a cover letter introducing ACEEE and explaining the project, a background piece intended to summarize past work in the area, and a list of other potential invitees (appendix).

The steering committee suggested a diverse list of stakeholders for use as the survey sample and potential roadmap participation group. The committee chose a balance of water and wastewater utilities, non-profits, electric utilities, consultants, government agencies and academics. From this compiled list, 62 survey packages were sent via e-mail to a wide variety of potentially interested stakeholder. The appendix contains a list of identified stakeholders. Follow-up surveys were sent a week later, and finally, an e-mail and fax of the survey package completed the effort.

**Results/Discussion.** Of the 62 stakeholders contacted, 20 surveys were returned. Table 1 provides a respondent profile.

**Table 1. Survey Respondent Profile**

Resp. ID	Community Represented		Category <sup>2</sup>			
	Water	Waste-water	Elec. Utility	Water Utility	R&D	Consultants/Vendors
3	X					X
5	X	X		X		
6						X
9		X		X		
17						X
22	X	X		X		
24	X	X		X		
25	X	X	X		X	
26		X			X	
33	X	X				X
34	X	X				X
37	X	X		X		
38	X			X		
39	X	X				X
46		X			X	
47	X	X			X	
48					X	
52	X				X	
63		X	X			
64	X	X		X		

<sup>2</sup> As characterized by the steering committee

*Water.* Systems optimization<sup>3</sup> ranked highest among opportunities for energy efficiency in the water sector. Respondents reported that specific opportunities include the incorporation of energy audits, energy management plans, shifting of energy intensive operations to off-peak times, demand management, and plant automation. Other opportunities identified by respondents include benchmarking and water efficiency/conservation.

Extensive technical and informational challenges as well as potential regulatory barriers were listed as reasons the opportunities had not been realized. Technically, respondents listed plant “overdesign” as the primary barrier. The tendency to design for infrequent and extreme events in this sector is large since the result of these events may have far reaching and dire human health implications. Respondents commented that this barrier is intertwined with local government and regulatory policies as well as the past experience of the operator.

Lack of information was also identified as a barrier. Informational barriers included the lack of operator knowledge of energy cost and energy use. Respondents emphasized education and informational campaigns to educate and encourage proactive managers and plant operators as approaches to overcoming these barriers. Specific education suggestions included training the operators about rate and tariff structures charged by electric utilities and the importance of benchmarking to saving money in the plant. Because the benefits of energy audits and benchmarking are financially risky, managers are not fully informed on the benefits associated with the risks. Respondents noted that creating pro-active managers in this way could uncover complex regulatory barriers related to rate design and tariff structure of electric utilities. That challenge and opportunity, however, will only materialize if water utility managers are educated as to how energy is used and paid for within their facilities.

*Wastewater.* In the wastewater sector, as with the water sector, respondents ranked optimization of processes within facilities as the first largest opportunity for energy efficiency because it can offer low cost solutions and incorporate demand management solutions. Related to optimization, respondents ranked motors and motor systems as the second largest opportunity for savings. Spanning all ranks and cited most often as a large opportunity for savings was the incorporation of energy audits into management practices. Process modifications (primarily aeration) and distributed generation using biogas were also listed as large opportunities for savings in the sector.

Notably one respondent pointed to the largest savings opportunity as related to changes to urban land use planning and the impacts on development. Decisions made by local authorities about how development is allowed can effectively define future demand loads placed on water and wastewater systems. Local ordinances and codes can be an effective vehicle for encouraging water efficiency (reducing overall water and wastewater demand) or limiting allowable discharge concentrations into municipal sewers (particularly from industrial facilities) thus encouraging pretreatment of the waste stream at the source where the least cost option.

Respondents also listed institutional, informational, market and regulatory barriers to these energy efficiency opportunities. Institutional barriers were most often cited, and included a lack

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<sup>3</sup> For the purposes of the study, we assumed general definitions for the term “systems optimization.” This definition includes sensors and monitors.

of managerial knowledge and understanding of energy efficiency opportunities. The most explicit comments regarded the lack of energy management plans at the facility level.

A notable institutional barrier raised in relation to every energy efficiency improvement was that plant managers view energy efficiency as a tool to achieve regulatory compliance, not as a cost, capacity or energy savings opportunity. Survey respondents indicated that plant-level use of cost effective energy efficiency is primarily to ensure that the plant is in environmental permit compliance. Plant operators do not use energy efficiency as a stand-alone cost savings or productivity enhancing tool. The reason for this is that the primary mission of water utilities is to provide a safe reliable supply of water to customers. Procedures or processes, such as energy efficiency, that are not viewed as forwarding that mission are not considered.

Informational barriers reported included a lack of education regarding opportunities for plant managers as well as a lack of communication of case, benchmarking, and cost effectiveness studies. Market barriers listed included the lack of financing capital and a general lack of incentives for energy efficient upgrades. Reported regulatory barriers relate to electricity rates and tariffs as well as procurement policies. Some respondents pointed directly to the lack of regulation of utility “exit fees” as a negative incentive for promoting energy efficiency technologies and practices, though there fees appear to be declining in use. Other respondents indicated that the procurement policies of most municipalities strictly limit the choices of the plant managers, limiting their ability to install energy efficient technology.

**Overarching Opportunities.** Prior to this survey, the predominant energy efficiency stakeholder approach to program design has been to target both the water and wastewater sectors as a single market. This approach allows for the streamlining of resources and is particularly effective when technology types at the end-use of processes are the same. For example, if motors are a major energy end-use for both sectors, then a motor efficiency program targeting both sections would streamline program resources and have a significant impact. Further, because this roadmap effort focuses on municipalities, which often have combined water and wastewater responsibilities, the deployment of programs would be simplified.

To the extent that water and wastewater facilities are optimizing the same end use energy technology systems, the results of this survey support the combined water and wastewater sector approach of energy efficiency programs. From the opportunities listed by both the water and wastewater communities, we can conclude that optimization will often refer to motor efficiency gains and “right-sizing” of facilities, based on realistic growth and consumption estimates.

Government procurement practices are another area of programs that can be deployed to the water and wastewater sectors for maximum impact. As a result, a large number of the stakeholders in the sector will have to go through government procurement agencies for supplies. Increasing knowledge and flexibility pertaining to energy efficient products at the procurement office would have a broad impact in both the water and wastewater sectors.

The previous two examples are representative of the opportunities available to both the water and wastewater sectors in terms of energy efficiency. There are sector specific opportunities, such as

biogas in the wastewater sector that should be acknowledged and approached separately by the energy efficiency programs.

**Research, Market and Policy Opportunities.** The last section of the survey covered the similarities in the two sectors and asked the respondents to identify broader, longer range opportunities for and barriers to energy efficiency through research, market and regulatory changes, and federal and state policies.

The first of these three questions queried respondents as to what research is needed in the sector to overcome the barriers to energy efficiency. The responses fell into two primary categories: technology and education/information. In the technology category, respondents identified waste heat and other technology case studies and demonstrations as the primary research. Respondents also commented that the dissemination of the results must be widespread to overcome informational barriers. Finally, respondents emphasized the importance of a benchmarking procedure that would allow the case studies and information to be interpreted uniformly between facilities.

The second question, which asked respondents to identify upcoming market or regulatory changes that would have an impact on energy efficiency promotion in the water and wastewater sectors, drew a variety of responses. The most common response was in reference to growing security concerns at these facilities. Energy efficiency must be framed as security enhancing to be a priority in the future. Other market and regulatory changes that may have an impact on the sectors are the Sewer Long Term Control Plans, Clean Air Act amendments, and general regulatory uncertainty.

Finally, respondents were invited to suggest state and federal policy actions that, if implemented, would promote energy efficiency in the sector. Respondents had many ideas for a governmental role. The most common idea was the implementation of financial incentives for municipalities to encourage installation of high capital projects, for design assistance, for renewable energy systems, and for conservation of water and energy. A variety of permit streamlining and rate change suggestions were also put forth: review and removal of unnecessary permits, and governmental intervention to remove exit fees. Finally, one respondent suggested a national energy plan that incorporates the needs of water and wastewater facilities.

**Discussion Guidelines for ACEEE's Water Energy Roadmap Meeting.** Based on the results of the survey presented above, ACEEE suggests the following key topics of interest to a broad range of stakeholders to be the focus of discussion at the roadmap meeting:

- 1) *Process Oriented Energy Saving and Productivity Gain Opportunities.* Many stakeholders reported process optimization to be the largest opportunity for energy savings.
- 2) *Relations with Electric Utilities.* Communication between the electric utility and the water utility (in general one of its largest customers) is lacking, as is an understanding of rates and tariffs.
- 3) *Informational, Technical, and Market Barriers.* This discussion topic covers the lack of communication, understanding and transfer of information to appropriate parties within

management and the facility, as well as what steps can be taken to overcome the difficulties. The surveys included multiple references to these types of barriers in the survey responses, including research needs for demonstration as well as the dissemination of the information collected in those projects.

- 4) *Institutional Barriers*. Internal water utility attitudes and management techniques support many barriers to energy efficiency. Respondents indicated that a change in the way management views energy costs and their connection to productivity and cost savings must be clarified for progress to be made. Issues related to compliance introduced in the survey are an example of failure of the energy efficiency program developers and implementers to adequately communicate the beyond compliance benefits of energy efficiency.

Appendix 1: Stakeholder Survey Instrument (next page)



**Water/Wastewater Industry Energy Roadmap  
Project: Stakeholder Survey  
March 2004**

Please return Survey to Liz Brown, [lbrown@aceee.org](mailto:lbrown@aceee.org), phone: 202 429-8873, fax 202 429-2248  
by **DATE**

Identification Information

Name	
Title	
Company	
Phone	
Fax	
E-mail	

Are you interested in attending the roadmapping session in Washington, DC in the late spring or summer of 2004? Yes \_\_\_\_\_ or No \_\_\_\_\_

Survey Questions

)Rank the following opportunities for energy savings and/or productivity enhancements through energy efficiency in the **water** industry from 1-5 (1 being the largest opportunity)?

- \_\_\_ Benchmarking
- \_\_\_ Energy Audits
- \_\_\_ Incorporating Energy Considerations into Procurement Strategies
- \_\_\_ Motor Systems
- \_\_\_ Operations and Energy Use Optimization
- \_\_\_ Power generation from biogas
- \_\_\_ Process modifications (please specify) \_\_\_\_\_
- \_\_\_ Water Efficiency/Conservation
- \_\_\_ Other (please specify) \_\_\_\_\_

) What aspect (s) of your higher ranks makes it the largest opportunity for potential savings?

)Of your highest rank, please list the barriers that need to be overcome for the opportunity to be recognized.

)Rank the following opportunities for energy savings and/or energy efficiency productivity enhancements in the wastewater industry from 1-5 (1 being the largest opportunity)?

- Benchmarking
- Energy Audits
- Incorporating Energy Considerations into Procurement Strategies
- Motor Systems
- Operations and Energy Use Optimization
- Power generation from biogas
- Process modifications (please specify) \_\_\_\_\_
- Water Efficiency/Conservation
- Other (please specify) \_\_\_\_\_

)What aspects of your highest rank makes it the largest opportunity for potential savings?

) Of your highest rank, please list the barriers that need to be overcome for the opportunity to be recognized.

)In the interest of overcoming barriers, what research needs to be completed, what information needs to be available, and what specific questions need to be answered, in order to assist the industry with increasing energy efficiency?

)In the next five years, are there any specific market or regulatory changes that you identify as impacting energy efficiency in the water and wastewater industries? If so, what are those changes and how will they impact the industry?

)What federal and/or state policy changes can you envision that could encourage energy efficiency in your highest identified rank in the water and wastewater sectors?

) What do you view as the next steps for increasing energy efficiency/productivity in the water and wastewater industries?

